DOCUMENT RESUME

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ABSTRACT

This self-paced student training module on trowel trade work processes is part of the course, Trowel Trades, which was developed for Preapprenticeship Phase 1 Training. (A companion instructor's guide is available separately as CE 032 868.) The course is designed to provide students with an orientation to the trade and an opportunity to explore it. The purpose of the module is to teach students to identify and describe the major work processes and tasks of the trowel trades. The module may contain some or all of the following: a cover sheet listing module title, goal, and performance indicator; study guide/checklist with directions for module completion; introduction; information sheets providing information and graphics covering the module topic(s); supplementary references; self-assessment; self-assessment answers; post assessment; and post-assessment answers. (YLB)

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ED217236

INDIVIDUALIZED LEARNING SYSTEMS

PRE-APPRENTICESHIP PHASE 1 TRAINING

TROWEL TRADE WORK PROCESSES

Goal:

Upon completion of this module, the student will be able to identify and describe the major work processes and tasks of the trowel trades.

Performance Indicators:

The student will demonstrate his or her knowledge by successfully completing both a Self Assessment and Post Assessment covering the identification and description of the major work processes of the trowel trades.

ED 032 872

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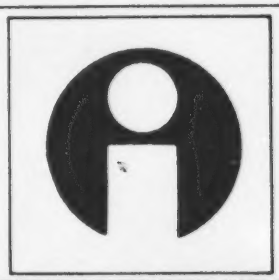
Study Guide



To successfully complete this module, complete the following tasks in the order listed. Check each one off as you complete it.

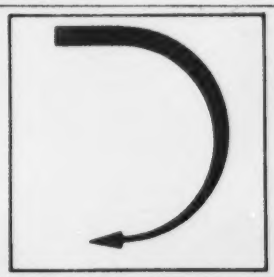
1. ____ Read the Goal and Performance Indicators on the cover of this module. This will inform you of what you are expected to gain from completing this module and how you will demonstrate that knowledge. Read the Introduction section to understand why this module is important.

2. ____ Study the Information section of this module to acquire the knowledge necessary to complete the Self and Post Assessment exams.

3. ____ Complete the Self Assessment exam and compare your answers with those on the Self Assessment Answer Sheet on the page immediately following the exam. Re-study or ask your instructor for help on any questions you have trouble with. The Self Assessment exam will help you determine how well you are likely to do on the Post Assessment.

4. ____ Complete the Post Assessment exam and turn your answers in to your instructor.

Introduction



The skilled worker must be able to identify the proper steps and their correct sequence in order to satisfactorily complete a project. Proper execution of all required tasks will result in an efficient and professional job.

Information

PLASTERING PROCESSES

While performing a plastering job there are 10 major tasks to be performed. Each has one or more steps to be executed. The sequence of tasks and of the individual steps is highly important to the overall success of the finished job.

The first task is to prepare the jobsite for the beginning of work. This includes checking the site for proper inspection certification (especially for base material), a visual check for level, plumb and square and true corners. Finally, a review of the job plans are in order.

From the plans and base material used, the proper type of plaster will be selected. This will allow the worker to set the appropriate dots and screeds indicating the plaster thicknesses desired.

The next step is to mix the basecoat plaster. Mixing proportions will be determined and the method of mixing, either by hand or mixing machine, will be selected.

If the hand mix method is chosen, there is a five step procedure to follow.

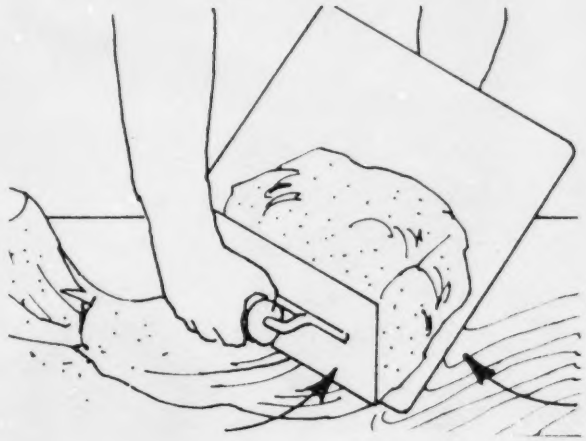
First, place ingredients into one end of the mixing box. This is called "charging the box." Use a layering technique by adding portions of the dry ingredients in layers to aid in complete mixing. Chop the dry ingredients using a mortar hoe to improve the mixing process. Water is added in small amounts and the chopping continues. Continue adding water until thoroughly mixed, using caution not to add excessive amounts of water. Excess water will weaken the plaster and cause the surface to crack.

For the machine mixing method, the following steps are performed. Add 90% of the water to a clean mixer. Any old plaster will serve as accelerators (speed up the set) to the new plaster mix. Next, add in 1/2 the sand and all of the plaster.

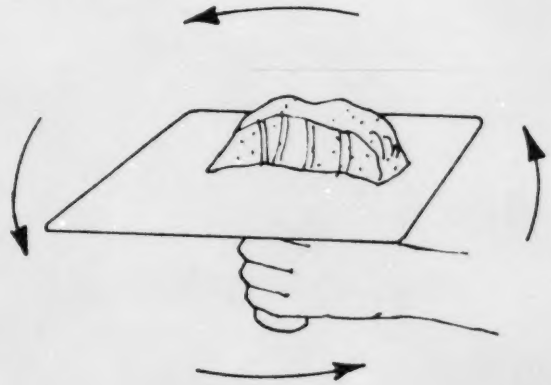
Then, add in the reamining sand. Introduce any admixtures required. Mix not less than 1/2 minute nor more than 3 minutes. Timing will depend on mixer speed. Plaster is ready to be dumped and used.

With the base coat plaster mixed, the next step is to apply it to the surface.

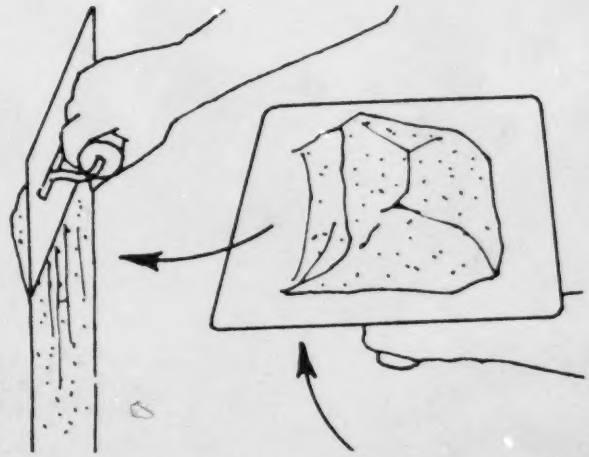
Following is the proper technique for applying plaster using hawk and trowel.



Scoop some mortar onto the mortar-board. Then, holding the hawk as shown, move the hawk and trowel towards each other. As the hawk and trowel meet, push the mortar onto the hawk while lifting both tools off the mortar - board.



After each trowel is lifted, bring the hawk down again so that it's parallel to the ground. Now turn the hawk 1/4 of a turn. This is so a new side of mortar is brought into position across from you. It also keeps the mortar in the center of the hawk. The hawk is easier to handle if the mortar is always kept centered.



Reach across the hawk and cut into the mortar with the edge of the trowel. In one smooth motion, tilt the hawk towards you and away from the wall. At the same time, lift and twist the trowel up and away from you. The hawk should now be facing you almost perpendicular to the ground. The trowel should be blade

up with the mortar on top of it (you are putting the mortar onto the trowel with the hawk.

Apply the plaster with a sweeping motion from side to side, making the first layer thin; immediately apply a second or "double" coat.

Using the rod, level the basecoat to dots and screeds. Following this, it is time to use the scarifier to roughen the basecoat surface before the plaster sets. This will improve finish coat bonding to the basecoat.

When the basecoat sets up, it's time to mix the finish plaster. Select the finish coat plaster and determine proper proportions. Follow mixing procedures outlined for mixing basecoat plaster. The final preparation of the basecoat (before applying the finish plaster) is to angle plane the surface to remove any protrusions.

Apply the initial layer of finish plaster, scratching in angles, featheredging the angles and then scratch between the angles. Allow this coat of finish plaster to "draw up," and then double up plaster to bring the finish coat thickness to 1/16" to 1/8". Next, sweeten the angles and sweeten the rest of the area. Water troweling is next. This process should be repeated at least twice until the finish sets. Brush water over the surface with a felt finish brush.

CEMENT FINISHING PROCESSES

There are 7 major tasks in preparing and finishing concrete work. Site preparation is the first task.

The first step in preparing the site is to read the blueprint or plan to determine the location of the slab and the type of finish to be applied. With the site located, the grade is established by excavating to subgrade, laying the vapor barrier and applying gravel and leveling the subgrade by using a builder's level. Next, the forms are prepared and placed by setting the corners and completing the rest of the form according to the plan. Check the form for level, plumb and square. Next, set out screed stakes (if required) and check for appropriate height. The gravel should be compacted using a roller or hand tamper, and the trade should be re-checked. The next step is to select the type of concrete to be used. This will depend on the exposure the concrete will face. There are three categories of exposure: mild, where the concrete is not exposed to abrasion or severe weather; normal, for watertight structures and/or mild weather; and

severe, where the concrete is subjected to strong wear, weather and weak acids or alkali solutions.

By knowing the exposure, the proper concrete slump can be selected (the more severe the exposure, the lower the slump to use). Using less water will create lower slump. This will contribute to the selection of proper mixing proportion.

The proportions for low slump concrete are: 4 1/3 parts moist sand, 1 3/4 parts dry cement, 2 2/3 parts aggregate (1 1/2") and 1 part water. The mix is adjusted according to the following proportions for high slump concrete: 4 1/3 parts moist sand, 1 3/4 parts dry cement, 2 2/3 parts aggregate (1 1/2") and 2 parts water.

With ingredients at hand and the correct proportions selected, the mixing begins. With a hoe or shovel, mix the dry ingredients thoroughly in a wheelbarrow or box. Create a mound out of the dry mixture with a depression in the center. Slowly add 1/2 to 3/4 of the water while folding in (mixing) the dry ingredients. When completely mixed, deterine if any remaining water is required. The mix must now be tested for consistency and slump.

Proper concrete consistency is demonstrated by the following test: shovel or pour part of the mixture onto a clean, damp surface and work with a hoe or shovel. Lightly float the mixture by running a trowel over it until the spaces between aggregate are filled. Pick up some of the concrete with a shovel. The mixture should slide off the shovel. It should be wet enough to stick together without crumbling.

In order to check the slump, a small amount of concrete should be formed into a cone shape on a clean damp surface. (Specially made slump cones are available for this.) Measure the height of the cone immediately. Note the decrease in the height of the cone as the concrete settles. A small decrease means low slump; a large drop means high slump.

With testing accomplished, it is time to place the concrete into the forms. Concrete should be placed in the form as close to its final location as possible and not worked around unnecessarily.

With the concrete in place, consolidate it with a tamp or jitterbug. A straightedge

may be used to level concrete before consolidation, if desired. After consolidation, remove any screed stakes.

The finish work now begins. Begin by immediately using a bull float to level the surface and use a darby to level the edges of the slab. Be careful not to overwork the surface as this leads to imperfections later. Bleed water and sheen must dissipate before continuing further.

When conditions permit, round off open edges with an edger to prevent spalling (chipping). Cut any required control joints using a jointer or groover. The concrete must now be allowed to set until a person's weight leaves a depression of 1/4" or less before continuing.

Once it has set up, float the surface with a hand float, making wide arcs; continue until the surface is smooth. Now, begin to trowel the surface. Place the trowel flat against the surface, making wide sweeping arc. Overlap the previous stroke slightly (about 2").

When the surface moisture from the first troweling has evaporated, begin the second troweling, using a smaller trowel. Tilt the blade slightly with trowel's trailing edge down to apply increased pressure. This process is repeated, using smaller trowels and increased angle until the trowel makes a ringing, scraping noise across surface. After troweling is complete, the surface may be textured using a broom or burlap.

The final step of cement finishing is the curing process. This allows the hydration process to properly take place and limits the possibility of cracking, chipping and dusting on the concrete surface. There are three main types of curing. One of these methods is generally selected.

The first is the water cure. Water is applied to finished concrete with a spray mist and continued over a period of at least 3 days. The second method is to provide a mechanical barrier of waterproof paper or plaster to seal in water and prevent evaporation. Concrete should be covered as soon as finishing is completed. The third choice consists of using a chemical membrane. These compounds are applied to the finished surface in a spray mist as soon as the water sheen disappears. It is essential that a uniform and complete coverage is accomplished. This usually requires two applications.

BRICKLAYING

The process of bricklaying can be broken down into seven tasks, each involving several steps.

The bricklayer must first prepare for the job by reviewing the blueprint or plan to establish the size, type and location of the project at hand. The bonding pattern and the type and size of the masonry unit to be used is determined at this time, also.

With this information, the layout of the project must be transferred from the plan to the actual job site location. Begin by establishing wall lines using a chalkline. Lay a dry course of bricks, allowing room for mortar head joints. Mark joint location on the layout surface and move the bricks aside. Re-check the layout for square at this time. Once the layout is ready, the next step is to select and prepare the mortar.

Mortar is the bonding agent that ties masonry units together. It is made from cementatious materials like portland cement, lime, aggregate (sand) and water. There are three general types of mortar mixes used in bricklaying. Type 1 is for general use. Type 2 is used when moderate sulfate resistance or moderate hydration (curing) heat is wanted. Type 3 is used when high early strength is desired. Requirements of the job and properties of the various types of mortars will allow for the selection of the correct mortar type.

Once mortar type is selected, it should be mixed. The proportions for a general use or Type N mortar are as follows: 1/2 to 1 1/4 parts lime, 3 3/4 to 4 1/2 parts sand, 1 part portland cement. These dry ingredients are mixed in the mortar box and then water is added slowly. Continue mixing and adding water until the mortar takes on a consistency that is easy to spread but clings to vertical surfaces. At this point, shovel the mortar onto the mortar board.

The mechanics of getting the mortar from board to brick is the next task. Hold the trowel with fingers under the handle and the thumb on top of the ferrule. Work the mortar into a pile in the center of the board. Smooth off a small area with a backhand stroke of the trowel. Cut a small amount of mortar away from the pile with a forehand pulling motion. Scoop the cut mortar onto the trowel with a quick clockwise turn of the wrist.

The bed joint is spread by unloading the trowel's mortar by snapping the arm backward in the direction of mortar line and tilting the outside edge up. The joint is then furrowed. Tilt the trowel nose down and pat the bed joint to create a uniform layer of mortar.

Locate the exact corner point of layout and set the first brick at this spot. Be sure to set it level and square to the wall line and double check. Lay the remaining bricks (4 to 5, depending on a project) in the lead corner, troweling mortar onto head joints. Use a builder's level to level the brick courses. The handle of the trowel may be used to tap bricks on sides and top edge to level. Line up the bricks along the the wall line, using the edge of the level along the outer edge of bricks. Repeat this sequence on the next lead corner. Work towards the center. On subsequent courses, use a line level to determine the appropriate level. Be sure to check joint sizes for uniformity. Use a builder's level to check for wall plumb at each new course.

As the mortar begins to set up, the joints must be struck with jointer/striker tools. The longer sled runner type is best for horizontal bed joints while the short jointers work best on vertical or head joints. Test the mortar for jointing by pressing in with your thumb. When the mortar dries to the point that it can be indented with reasonable pressure, the joint should be struck. Use care not to lay brick for such a period of time that unstruck joints set up beyond the stage where they can be struck.

Clean up the brick surface with a stiff brush to remove excess mortar from joints and brick face.

TILE SETTING PROCESSES

The tile setter's work can be broken down into 18 task categories, each with one or more steps involved.

Reviewing the blueprints or plans is the tile setter's starting point. Having reviewed the plans, the actual jobsite should be looked at to see if any preparation work needs to be done or if any previous trade people should be recalled in order to re-work or complete the areas.

With all prep work accomplished, lay out the job, using steel tapes and rules.

Find the centerline. Determine the tile size being used so that any required tile cuts may be identified. While arranging tile, layout a plan to float areas areas to get the largest cuts possible and to eliminate as many unsightly cuts as feasible. Make the required cuts using tile nippers. At this point it is important to check the square of the work surface to ensure that all areas will be regular and true. Use a builder's square.

After checking the work area, the screeds are set. These wood strips are designed to provide plumb and level intermediate surfaces for tile setting.

Mixing the mortar is the next step. First, determine the grade quality and moisutre content of the sand to be used. Second, determine whether a general (non-floor) or flooring mortar is required. The proportions for general mix mortar are: 3 parts sand, 1 part cement, 1 part lime; while floors use a 4 to 1 drypack mix.

Apply mortar to the work surface to screed level using a hawk and trowel. Float the surface by drawing a straightedge over the surface to remove excess mortar. Remove the screeds and fill in the indentations with additional mortar. Smooth the surface.

The next task is to select and mix the setting cement. This will be based largely on the tile manufacturer's recommendations and the specific product directions for mixing or preparing. Once mixed (some setting cements or "thinsets" are pre-mixed in a can), the setting cement is applied to the surface using a serrated trowel and following product instructions.

Tile is now set into the setting cement, following joint specifications given on the print. Tiles are set by hand and may be aligned with any straightedge. Any cut tile will probably be placed along the edges. Beat the tile into setting cement with a wooden block; a rubber or wooden mallet may be used to tap the block to assist in the beating process.

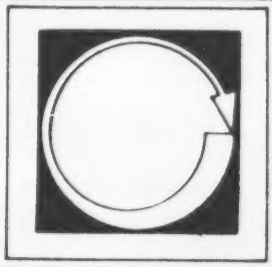
Clean the tile surface with water and cheesecloth. The tile courses should be leveled and checked for alignment with a builder's level and straightedge. Repeat these processes until the job area is covered. Wipe down all tiles and joints with water and cheesecloth or a brush.

Grouting the joints is the next step. The grout is selected and mixed according to manufacturer's recommendations and applied with a rubber float or other specified tool to all joints. Grout is floated in a circular motion, with enough pressure to force it into the joints by wiping the surface with a sponge or cheesecloth.

After grout clean-up, the tiles are cleaned or polished. Glazed tiles are polished, while unglazed tiles are only cleaned.

Caulking is applied to all required areas following manufacturer's recommendation. Any sealers required for the surface protection of the tile is applied as a final step.

Self Assessment



Answer the following questions in the space provided.

1. What are dots and screeds used for in plastering?

2. What does the term "charging the box" mean?

3. True/False. Layering dry ingredients in the mixing box is beneficial.

4. What is the time range for machine-mixing plaster?

5. Is there a delay before the "double-up" coat is applied?

6. What is the final task for all trowel trade work?

7. List the three types of exposures for concrete.

8. Using less water will create 1) higher or 2) lower slump in concrete.

9. After concrete is consolidated, is there a delay before floating takes place?

10. How many applications of chemical-curing membranes are generally required for curing cement?

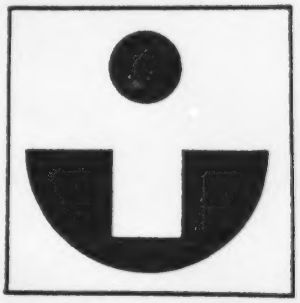
11. What function does mortar perform in bricklaying?

12. Which ingredient(s) is/are used first in mixing mortar, water or the dry ingredients?

13. Long sled runner type jointer/strikers are better for striking horizontal/vertical joints. (Circle the correct answer.)

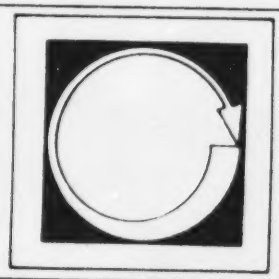
14. What tools are used when applying mortar?

Self Assessment Answers



1. to indicate proper/desired thickness
2. placing the dry ingredients into the mixing box
3. true
4. 1/2 min. to 3 min.
5. No. It is applied directly over the initial layer of plaster.
6. clean up tools and work area
7. mild, normal, severe
8. lower
9. no
10. 2
11. primary bonding between masonry units
12. water
13. horizontal
14. hawk and trowel

Post Assessment



Answer the question or complete the statement in the space provided.

1. How does excess water damage plaster?

2. When machine mixing plaster, which is added first, water or the dry ingredients?

3. When the water is added, is all of it added at once?

4. Why must old plaster be removed from tools and the mixer?

5. As the exposure facing concrete becomes more severe, how should slump be changed?

6. Should concrete be dumped in one large pile and then pushed to distribute it around the form, or placed as close to its final location as possible without extra working?

7. After bull floating and darbying, do the edges of a cement slab receive rounding without a waiting period?

8. Should there be an everlap of float strokes in cement finishing? If so, how much?

9. During concrete troweling, is the angle of the trowel increased or decreased with successive trowelings?

10. What are two properties of mortar that have the proper consistency?

11. Are mortar joints struck before or after the mortar has set up?

12. In tilesetting, which is applied first: mastic or mortar?

Instructor Post Assessment Answers

1. weakens the plaster and causes cracking
2. water
3. no, only 9/10 to begin with
4. Old plaster will accelerate the new plaster's setting time.
5. Slump should be lowered by reducing water.
6. placed as close to final location as possible
7. No, bleed water and sheen must disappear first.
8. yes, 2" approximately
9. increased
10. easy to spread and clings to vertical surfaces
11. before
12. mortar